Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 73

GOUDREAU AREA

(NTS 42C/SE)

District of Algoma

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by

John F. Gartner and D.F. McQuay

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MAP
(accompanying report)

Map 5097 (coloured) – Northern Ontario Engineering Geology Terrain Study, Data Base Map, Goudreau (NTS 42C/SE). Scale 1:100 000.

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John F. Gartner[1] and D. F. McQuay[2]

1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Goudreau area, District of Algoma. The area, which covers NTS block 42C/SE, lies between Latitudes 48°00′N and 48°30′N and Longitudes 84°00′W and 85°00′W. This report forms part of a series of publications which provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the mapping is to provide a guide for engineering and resource planning functions at a level of detail consistent with a scale of 1:100 000. The terrain information is contained on the Data Base Map (OGS Map 5097, accompanying this report).

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Interpretation of existing black and white aerial photographs, at scales of approximately 1:54 000, was the primary method of obtaining this terrain information. The interpretation was checked with published and unpublished literature which documented previous field visits and observations. During the summer of 1978, roads in the area were traversed and observed terrain conditions recorded as further verification of the office studies. Thus, the map represents a reconnaissance overview of the engineering conditions of the terrain.

An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further information on the mapping techniques, legend format, and possible uses of this information is available in the "Ontario Engineering Geology Terrain Study Users' Manual" (Gartner, Mollard, and Roed, in preparation), a companion publication to this series of maps and reports.

2.0 GEOLOGICAL SETTING:

2.1 BEDROCK:

Most of the terrain in the map-area is bedrock-controlled. Overburden is generally thin, except within the river valleys and lowlands, where glaciofluvial sediments occur. The rock terrain, composed of Precambrian felsic igneous rocks (e.g. granite) and metavolcanics (e.g. mafic lavas), is moderately to severely rugged.

A wide belt of metavolcanics crosses the map-area diagonally, from Wawa in the southwest to Missanabie in the northeast (Milne *et al.* 1972). These rocks have the most promising mineral potential of any found in the area, particularly for the occurrence of base metals, gold, and silver (Springer 1977).

Felsic igneous rocks occur in the northwest and southeast quadrants of the area. Since granites, diorites, and gneisses are the common rock types, mineral potential is poor in these areas (Springer 1977).

2.2 QUATERNARY:

Glacial ice advanced from the north-northeast, depositing a generally thin mantle of stony sandy till over the bedrock. This till is seldom more than 1 m thick on the crests of hills, but can be as much as 5 m or more on some of the slopes and in the valleys.

The ice front retreated to the north-northeast. Once deglaciation began, retreat of the ice front was rapid. Glaciofluvial processes, active during this deglaciation, left a number of Quaternary deposits (see Map 5097, accompanying this report). These deposits mark the occurrence of ancient spillways and esker trains.

There is a lack of evidence in this area which would indicate the position of a stationary ice front during deglaciation. Boissonneau (1965) mapped a narrow zone of recessional moraines extending eastward from Township 31, Range 27 (Dahl Township) to the Dog Lake-Wabatongushi Lake area in the northeast quadrant of the map-area. Boissonneau (1968) suggested that these moraines marked a local halt of the ice front.

The current terrain mapping has not positively identified deposits that can be attributed to a definite halt of the ice front in this area. However, kame deposits, which may be correlative with the Boissonneau moraines, have been mapped in the Wabatongushi Lake area.

3.0 ENGINEERING TERRAIN UNITS:

3.1 BEDROCK LANDFORMS:

3.1.1 Description:

Rock knob (RN) terrain is the most widespread engineering unit found in the map-area. It is typified by the following terrain unit symbol:

$$\frac{\text{RN(tMG/R,pOT)}}{\text{Hnj-D(M)}}$$

The symbol indicates that rock knobs (RN) are the dominant landform, relief is high (often greater than 60 m), and the terrain is knobby and

rugged (Hnj), and dry (D). The slopes of these bedrock hills and the valleys between the rock knobs are often covered by deposits of ground moraine (tMG/R), of varying thicknesses, and organic terrain (pOT). Surface drainage of these subordinate landforms is mixed wet and dry (M).

Thus, the bedrock controls the terrain conditions throughout most of the area, a situation which is significant from an engineering viewpoint.

3.1.2 Significance:

RESOURCES: Portions of the rock can be used for crushed stone purposes, but detailed evaluations of suitability for aggregate use would be required. Ground water resources within the bedrock will be limited to fractures, faults, and fissures. The occurrence of aquifers is unpredictable and the terrain has only fair potential for ground water supplies.

GENERAL CONSTRUCTION: The major constraint in terms of construction is the presence of massive, irregular, and complexly sloping bedrock outcrops, and of large boulders on the ground surface. This means that, in most instances, below-ground excavations will require blasting. Site grading will be expensive and rock fills will be necessary in grading works. Footing conditions for supporting foundations should be excellent on the bedrock, but route alignments will require rock cut-and-fill operations.

Because of the shallow drift cover and complex bedrock slopes, development activities will be more difficult, and hence more expensive, than in areas of thicker overburden. Construction will be extremely difficult in those areas of high, sheer rock cliffs and steep bedrock hills. Also, land management for any development would be complex. The variable and steep rock slopes, combined with the shallow overburden, will make the terrain sensitive to surface erosion, especially when cleared of vegetation.

WASTE DISPOSAL: The bedrock terrain is not amenable, in its natural state, to the disposal of waste, whether it be garbage, septic tank effluent, or industrial liquid waste. Development of lagoons or tile fields would require extensive grading of rock materials and importation of soil fill. Fractures in the bedrock could act as conduits for migration of effluents, and the impact on surface drainage courses could be significant.

3.2 MORAINAL LANDFORMS:

3.2.1 Description:

Ground moraine (MG) occurs as a subordinate landform in the rock knob terrain, as described in the previous section. There are only a few scattered areas where the glacial till attains a thickness adequate to warrant classification as the dominant unit. A typical terrain unit symbol is:

$$\frac{\text{tMG/R(pOT,RN)}}{\text{Lup-M}}$$

The ground moraine till (tMG) generally has a silty sand texture, with appreciable amounts of stones and cobbles. It usually forms a thin veneer over bedrock (/R), but in some cases can be as much as 5 to 10 m thick. Organic terrain and rock knobs (pOT, RN) occur as subordinate landforms, and as such are common throughout the terrain unit. Areas of swamp are often trapped between hills, and areas of bare rock outcrop can be expected on most hilltops.

3.2.2 Significance:

The engineering and resource significance of the ground moraine deposits is not particularly great in this area, since the deposits are generally thin and not extensive.

From a resource viewpoint, there is a lack of mineral aggregate materials, and ground water supplies will be difficult to locate.

Bearing capacities are probably adequate, but excavations may have to contend with bouldery materials, and even bedrock where the drift is thin.

Ground moraine often provides good sites for septic systems, landfills, and lagoons. However, detailed studies on depth of till, slope, and drainage are required prior to development of such facilities.

3.3 GLACIOFLUVIAL LANDFORMS:

3.3.1 Description:

Outwash (GO) and *esker* (GE, >>>>>>>) landforms occur in association with one another within this map-area. Occurrences of these landforms can be grouped into eight areas, as discussed below.

NEGWAZU-ELSIE LAKES AREA: Outwash deposits account for the main features of the landscape in the vicinity of these lakes, which are located in the northwest corner of the map-area. This outwash plain extends about 9 km south to Fungus Lake. A typical terrain unit symbol is:

$$\frac{\text{sgGO(sgGE,RN,pOT)}}{\text{Lup-Dh}}$$

The landform is predominantly a level to undulating plain (Lpu) composed of outwash sand and gravel (sgGO). The ground surface is dry, but a high water table is suspected (Dh). Three landforms occur as subordinate units: eskers (sgGE), rock knobs (RN), and swamps (pOT).

MAGPIE RIVER AREA: An esker-outwash complex follows this river from the northern boundary of the map-area south-southwest to Wawa on the southern boundary, a distance of about 70 km. At the southern end of this complex, in the Corporation of the Township of Michipicoten, there are classic examples of terraced outwash deposits, symbolized by:

$$\frac{\text{sgGO(sgAP,RN)}}{\text{Lpt-D(M)}}$$

The material is a gravelly sand to sandy gravel. Analysis of a sample from the Wawa area indicated a composition of 7 percent gravel, 91 percent sand, and 2 percent silt. An alluvial plain, consisting of coarse-grained soils, and some rock knobs can be expected as subordinate units. A number of aggregate pits are recorded with the Ministry of Transportation and Communications (MTC). Crushed products have been produced from most of these pits. North of Wawa, near Catfish Lake, MTC drill holes for bridge structures show as much as 21 m of stratified sand, gravel, and silt overlying bedrock.

Further north along the Magpie River, in the central part of the area, the outwash broadens and once again becomes terraced. Esker ridges are visible, and the terrain exhibits both kettles and terraces as evidence of its glaciofluvial origin. Ground moraine is a subordinate unit in some localities. Typical terrain unit symbols are:

$$\frac{\text{sgGO,tMG/R(AP)}}{\text{Lun-D}} \qquad \frac{\text{sgGO(RN,pOT)}}{\text{Lptk-D}}$$

Near Dubreuilville, outwash is the dominant landform, while eskers, organic terrain, rock knobs, and alluvial plains are subordinate. The map symbol for this terrain unit is:

$$\frac{\text{sgGO(sgGE,pOT,RN,AP)}}{\text{Lpuk-D(M)}}$$

Water well logs indicate thicknesses of sand and gravel in excess of 23 m.

HAWK JUNCTION AREA: The terrain south of this settlement is covered by extensive outwash deposits. Many pits have been developed in the outwash, and MTC records indicate an appreciable amount of crushable material. Some parts of the deposit may have a high water table. Boreholes for bridge structures over McVeigh Creek and Hawk River show 3 to 4.5 m of loose sand overlying about 18.3 m of loose to very dense silt and sandy silt.

GOUDREAU TO WABATONGUSHI LAKE: In this area, ground moraine is covered by sandy outwash deposits. Coarser esker materials are associated with these landforms, and bedrock knobs are common. A typical terrain unit symbol is:

$$\frac{\text{sGO,tMG/R(pOT,RN)}}{\text{Lu-M}}$$

Terrain conditions are variable and complex. North of Lochalsh, an esker complex contains some kame-like landforms; this area is correlative with that described by Boissonneau (1968) as an end moraine. The symbol for this terrain unit is:

$$\frac{\text{sgGE,sgGK(pOT,RN)}}{\text{Luk-D}}$$

MEATH TOWNSHIP: An esker-outwash deposit, containing areas of good, deep granular material, covers a portion of this township which is located in the northeast corner of the map-area. Rock knobs and swamps also occur within this unit.

MISSANABIE AREA: Outwash sand and gravel overlie ground moraine, with water well logs indicating more than 12 m of material over bedrock in some areas. Some pits have been opened for the supply of sand and gravel, but they satisfy only local demand. A characteristic of the unit is its variability and complexity, as indicated by the dominant symbol:

$$\frac{\text{sgGO/tMG(RN,pOT)}}{\text{Lpu-D(M)}}$$

DALTON AREA: Gravelly sand outwash underlies this settlement which is located on the eastern edge of the map-area. Boreholes put down by the MTC for bridges along the highway indicate more than 50 m of stratified sand, gravel, and silt overlying bedrock. The material is predominantly sandy in texture, but a small pit in the southern part of the landform indicates the presence of gravel to gravelly sand, material which could be crushed for aggregate.

SHIKWAMKWA-JACKPINE RIVERS AREA: These rivers, located in the southeastern corner of the map-area, have esker-outwash complexes occupying their valleys. Rock knobs and extensive alluvial plains are integral parts of this terrain unit.

3.3.2 Significance:

RESOURCES: The eskers and outwash deposits possess the best potential for sand and gravel resources in the map-area. Existing pits and boreholes suggest that much of the material becomes finer with depth. Those areas with the best potential are north and east of Wawa, around Dubreuilville and southeast along the Magpie River, and northeast of Dog Lake.

A number of water wells have been drilled in these glaciofluvial landforms, and where the deposits are deep and permeable, there appears to be good potential for the development of water supplies.

GENERAL CONSTRUCTION: Most of the glaciofluvial landforms are part of complex terrain units, associated with subordinate amounts of ground moraine, rock knobs, organic terrain, and alluvial plains.

Because of this terrain variability, construction conditions will also be variable. However, where deep sand and gravel occur, construction conditions should be good. The material will have acceptable handling qualities for general grading operations, and construction of foundations should present few problems. Excavations in these deposits may encounter variable conditions in some areas, but generally should be relatively free from serious difficulties. Problems can be expected where rock is close to surface, where ground water levels are high, and where organic and alluvial landforms are found. Site-specific investigations are necessary prior to engineering design.

WASTE DISPOSAL: In the most general sense, the map-area is underlain by either rock terrain or glaciofluvial sand and gravel. Disposal of wastes in rock terrain is not advised, and disposal within the glaciofluvial landforms could result in migration of contaminants into both ground and surface waters. Since there is need for land disposal of wastes, locating such facilities in the glaciofluvial deposits will prove more acceptable than in the rock terrain. However, hydrogeological studies are necessary prior to the design of any waste disposal facilities, in order to determine the impact of the facility on the environment.

3.4 ORGANIC TERRAIN LANDFORMS:

3.4.1 Description:

Organic terrain (OT) occurs either as a simple landform type, for example:

$$\frac{\text{pOT}}{\text{Lp-W}}$$

or as a subordinate landform in conjunction with glaciofluvial and rock knob terrain. In some cases, the organic material occurs as a veneer over outwash (pOT/sgGO). In all cases, the landform is characterized by poor drainage, high water tables, and compressible materials with very poor engineering characteristics.

3.4.2 Significance:

From an engineering viewpoint, organic terrain is generally not suitable for most types of development. Compressible soils, high water tables, and poor surface drainage all place severe constraints on any type of activity. If possible, these landforms should be avoided as development sites.

4.0 SUMMARY OF ENGINEERING SIGNIFICANCE:

The preceding section described the characteristics of the major landform types and the engineering and resource significance of these units. Table 1 is a summary of the general engineering significance of the more common terrain units found in the area. This table is intended only as a guide to help the reader in assessing the overall significance of the map units. Site-specific work is necessary to better define actual ground conditions. Also, it must be realized that there are a number of conditions, such as drainage and slope, which are not considered in the table but which may affect the engineering significance of the various terrain units.

TABLE 1 SUMMARY OF ENGINEERING SIGNIFICANCE.

		BEDROCK		GLACIOFLUVIAL		ORGANIC
		RN	sgGO	sGO,tMG/R	sgGE	pOT
RESOURCE POTENTIAL	Sand & Gravel	N/A	Good	Fair	Good	N/A
	Water Supply	Poor	Good	Fair	Fair	Poor
LIGHT CONSTRUCTION CONDITIONS	Excavation	Difficult	Good	Fair	Good	Poor
	Foundation	Excellent	Good	Good	Good	Very Poor
	Grading	Very Difficult	Good	Good	Good	Very Poor
	Material Re-Use	Rock Fill	Good	Good	Good	Very Poor
WASTE DISPOSAL	Septic	Very Poor	Good	Good	Good	Very Poor
	Landfills	Poor	Fair	Fair	Fair to Poor	Very Poor
	Lagoons	Very Poor	Fair	Fair	Fair to Poor	Very Poor

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42C-1	Highway 651 & Goldie River
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42C-3	Highway 651 & Windermere River
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75-313	Highway 651
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